Engineers: DC Power Saves Data Center Dough

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By Jeffrey Burt

Engineers at the Lawrence Berkeley National Laboratory and about 20 technology vendors this month will wrap up a demonstration that they said shows DC power distribution in the data center can save up to 15 percent or more on energy consumption and cost.

The proof-of-concept program, set up at Sun Microsystems' Newark, Calif., facility, offered a side-by-side comparison of a traditional AC power system and a 380-volt DC distribution system, running on both Intel-based servers and Sun systems.

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The program measured energy efficiency at both the facility and rack levels. The findings backed up the researchers' expectations, said project leader William Tschudi.

"Our goal was to show that you could really do this with commonly available products," said Tschudi, in Berkeley, Calif.

The proof-of-concept has been running since June, and has hosted several open houses, giving businesses and technology providers alike a look at the advantages of DC power, Tschudi said.

The group has scheduled two more open houses at the site for Aug. 9 and 16 before it's dismantled, and will issue a final report in the fall.

At the same time, they will begin taking the next steps, including looking for a large business willing to become an early adopter by setting aside part or all of its data center for a DC power distribution system, Tschudi said.

DC power is getting a look as businesses and technology vendors search for ways to address the growing problems of energy consumption and heat generation in the data center.

A combination of smaller and more powerful processors, greater server density and rising energy costs have made power and heat key data center concerns over the past few years.

The costs are such that Bernie Meyerson, chief technology officer of IBM's Systems and Technology Group, said Aug. 1 that by next year, many companies will be paying more to power and cool their data centers than for the products that they put into them.

Chip and systems makers are making strides in hardware, software and management to address the issue, including more efficient processors and management software that gives administrators greater control over the thermal issues.

Some observers say that such technologies make solutions like DC power less relevant, particularly if bringing in a DC distribution system means having to spend a lot of money to retrofit an existing data center.

A DC system also would mean having to bring in larger cables than now exist with AC power. DC power is more of a niche idea that could help high-end users with large data centers, but will have less use to many other businesses, according to critics.

Click here to read more about the use of DC power in the data center.

However, proponents point not only to the cost savings, but also to the fact that the demonstration by the Berkeley Lab showed that it can be done with products that are available now.

The biggest issue as far as products are concerned is that there is no commonly available converter for the back of the servers, Tschudi said. For the proof-of-concept, the connections were hard-wired.

Otherwise, the technology is already there, said Dennis Symanski, worldwide compliance officer for Sun, in Santa Clara, Calif.

"This isn't a big deal for [systems makers like Sun]," Symanski said. "We've already got the power supplies. The biggest piece [that needs to be addressed] is on the facility side, on what's inside the data center."

Next Page: DC power's expanding role.

Tschudi said the energy savings found by the demonstration were significant. At the facility level, they were up to 15 percent, and while they're still making final calculations, preliminary numbers at the rack level show similar results.

In addition, other factors that would be found in a full data center—such as redundancies—would probably increase those savings, he said.

Other savings would be found in that less heat would be generated, which would lower cooling costs, Symanski said.

In a traditional data center, AC power comes in from an outside power source. Once inside, it goes through multiple conversions back and forth with DC before finally reaching the servers, which run on DC.

It's at those conversion points where electricity is lost and heat is generated. At one point in the process, the power is switched to 380v DC power, so keeping it at the stage throughout the entire data center isn't a stretch, Symanski said.

Overall, DC power would have fewer moving parts and conversion points, improving reliability and energy efficiency, Tschudi said.

DC power already has a role in data centers. Telecommunications companies use it in a lot of their systems, and Rackable Systems offers a line of DC-powered products at the server, rack and facility level.

The Milpitas, Calif., company struggled with its second-quarter earnings, seeing its stock price dip almost 40 percent thanks in large part to a decline in its flagship Foundation Series systems for scale-out environments, which does not include its newer Scale Out Series servers, storage or DC offerings.

The company has said that as much as 35 percent of Rackable's $83 million in revenue in the fourth quarter of 2005 were from DC products. In addition, several companies, including Pentadyne in Chatsworth, Calif., and Active Power in Austin, Texas, are also offering flywheel technology as alternatives to UPS (uninterruptible power supply), a battery backup in AC systems.

Symanski said customers for several years have been asking about other options for powering data centers. "They either have data centers that are very large and they generate a lot of heat … or they want to get more stuff without creating a heat problem," he said.

Gannett is looking to revamp the power infrastructure of its 15,400-square-foot data center in Washington, and has been investigating DC power as an alternative to AC, said Gary Gunnerson, IT architect for Gannett, in McLean, Va., and an eWEEK Corporate Partner.

Gunnerson said the proof-of-concept bolstered his belief that DC power could result in savings, though he was unsure whether it would fit into Gannett's plans.

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"So far, I'm convinced there are power and infrastructure savings, but I'm not convinced that a replacement ROI [return on investment] makes sense," he said.

"I had hoped the … experiment could provide tools that allowed some specific data that could drive a data center retrofit evaluation. I'm not yet sure we have enough information for that [evaluation]. Green-field installations should carefully consider a DC environment and see if their entire spend makes sense."

Finding such a business is a key next step, Tschudi said.

Several large companies who viewed the experiment indicated an interest in using DC power in part or all of their data

center, so members of the project will try to meet with some of them in the fall to see which would be best suited as an early adopter.

In addition, there are other areas around DC distribution systems that need to be studied, including cost implications and reliability issues, he said.

The group will meet with the experiment's sponsor, the California Energy Commission, to determine whether there is available funding for more studies.

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